King Saud University
College of Science
Department of Physics and Astronomy

((الحلول بإجابات الصحيحة موجودة في نفس الورقة))

First Term (1433-34)	Final Exam	Phys. 145
Monday 02 Rabi I 1434	14 January 2013	9:00 - 12:00

Student Name in English	
Registration Number (ID)	
Classroom/Teacher	

Write your selected answers for each question here:

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9
A	B	C	All	D	A	C	D	D
Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18
C	B	C	E	C	D	B	D	C
Q19	Q20.	Q21	Q22	Q23	Q24	Q25	Q26	Q27
E	A	B	D	E	B	B	A	E

1) **Please do not forget to write your name on this page**
2) **Separate this page from the other pages**
3) **Give <u>only this page</u> to your examiner at the end of the Exam**

Assume $g = 9.8\ m/s^2$, $h = 6.63 \times 10^{-34}$ J.s, $c = 3 \times 10^8$ m/s, 1 eV = 1.6×10^{-19} J.

Version A

Q1. A boy walks 8 m to the East in 2 s and then 6 m to the north in 8 s. What is his average speed and the magnitude of his average velocity?

A) 1.4 m/s, 1.0 m/s; B) 1.2 m/s, 1.2 m/s; C) 1.4 m/s, 1.4 m/s; D) 0 m/s, 1.0 m/s; E) 1 m/s, 1.4 m/s

Q2. If $\mathbf{A}=2\mathbf{i}+3\mathbf{j}$ and $\mathbf{B}=-4\mathbf{i}-7\mathbf{j}$, the new vector $\mathbf{C}=2\mathbf{A}-\mathbf{B}$ is:

A) $-2\mathbf{i}+9\mathbf{j}$ B) $8\mathbf{i}+13\mathbf{j}$ C) $12\mathbf{i}-4\mathbf{j}$ D) $-\mathbf{i}+2\mathbf{j}$ E) $4\mathbf{i}+6\mathbf{j}$

Q3. The brakes of a car exert a force of 890 N. The car is on a horizontal road and decelerates from 15 m/s to 4.5 m/s in 10 s. Thus, the weight of the car is:

A) 2.5×10^2 N B) 2.5×10^3 N C) 8.3×10^3 N D) 1×10^5 N E) 8.3×10^5 N

Q4. An oblique 150 N pulling force acting at 35° up with respect to the horizontal on a 30 kg object moving on a rough horizontal table where the coefficient of kinetic friction equals to 0.25. What is its acceleration? $a = 2.36\ m/s^2$

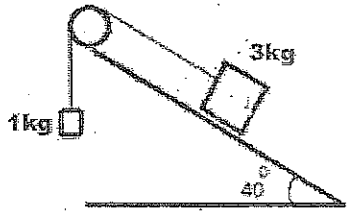
A) 1.44 m/s^2 B) 0.42 m/s^2 C) 0.61 m/s^2 D) 5 m/s^2 E) 43.25 m/s^2

Q5. If a moving object has a negative velocity while its acceleration is positive, what can we conclude?

A) a constant acceleration B) a uniform motion C) an accelerated motion
D) a decelerated motion E) can't conclude

Q6. 2 objects at the ends of an inextensible rope over a pulley, as shown on the figure, have the same displacements and velocities. Neglecting frictions, compute the final velocity if they started from rest at the same high and mass 1 kg moves 3 m up.

A) 3.7 m/s B) 5.44 m/s C) 7.34 m/s
D) 13.65 m/s E) 29.57 m/s



Q7. A free falling object is drop from a height of 9 m. What is its final velocity?

A) 6.6 m/s B) 9.4 m/s C) 13.3 m/s D) 88.3 m/s E) 176.6m/s

Q8. An 80 N crate slides at constant speed a distance of 5 m downward along a slope that makes an angle of 30° with the horizontal. The work done by the force of gravity is:

A) −400 J B) −200 J C) −69 J D) 200 J E) 400 J

Q9. A 5 kg object, initially at rest, is under the action of a 3 N net force during 3s. Thus, the object moves:

A) 0.3 m B) 0.9 m C) 1.8 m D) 2.7 m E) 45 m

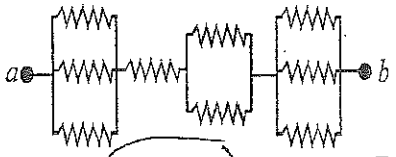
Q10. Two objects interact with each other and with no other objects. Initially object A has a speed of 5m/s and object B has a speed of 10 m/s. In the course of their motion they return to their initial positions. Then A has a speed of 4 m/s and B has a speed of 7 m/s. We can conclude:

A) the potential energy changed from the beginning to the end of the trip
B) mechanical energy was increased by nonconservative forces
C) mechanical energy was decreased by nonconservative forces
D) mechanical energy was increased by conservative forces
E) mechanical energy was decreased by conservative forces

Q11. What is the total current passing through a cell if 360 C charge is transported through for 30 minutes?

A) 2 A B) 0.2 A C) 20 A D) 10 A E) 0.1 A

Q12. What is the equivalent resistance between *a* and *b* if each resistor is 6 Ω?

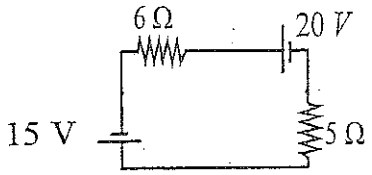


A) 81 Ω B) 19.5 Ω C) 13 Ω D) 27 Ω E) 65 Ω

Q13. A cylindrical wire has a resistance of 8 Ω. A second wire made of the same material is twice as long and has half the diameter. Its resistance is:

A) 1 Ω B) 2 Ω C) 8 Ω D) 32 Ω E) 64 Ω

Q14. The electric current *I* passing through the circuit is:



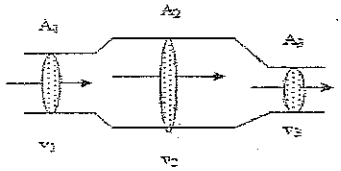
A) 0.357 A B) 0.143 A C) 3.18 A D) 4.13 A E) 4.37 A

Q15. An ideal fluid flows at 18 m/s in a horizontal pipe. If the pipe widens to three times its original radius, what is the flow speed in the wider section?

A) 12 m/s B) 6.0 m/s C) 4.0 m/s D) 2.0 m/s E) 4.0 m/s

Q16. Which of the following is true of the pressures in each section of the pipe?

A) $p_1 > p_2 > p_3$
B) $p_2 > p_1 > p_3$
C) $p_3 > p_2 > p_1$
D) $p_2 > p_3 > p_1$



Q17. A lens is made of glass with n = 1.5. One side is convex and has a radius of curvature equal to 0.08 m. If the focal length of the lens is f = 0.2 m, the radius of curvature of the other surface is:

A) 5 m B) 12.5 m C) 2.5 m D) 0.4 m E) ∞

Q18. The focal length of a lens with a power of 5 diopters is:

A) 0.05 m B) 0.1 m C) 0.2 m D) 5 m E) 50 m

Q19. The position of the image of a flower placed 50 cm from a 5 cm focal length camera lens is:

A) 0.93 cm B) 1.14 cm C) 2.12 cm D) 3.21 cm E) 5.56 cm

Q20. The work function of tungsten is 4.49 eV. The threshold wavelength for photoemission is:

A) 0.276 μm B) 0.276 nm C) 276 pm D) 356 nm E) 3.56 nm

Q21. The kinetic energy of an electron ejected from a sodium surface whose work function is 2.28 eV when illuminated by light of wavelength 500 nm is:

A) 0.1 eV B) 0.2 eV C) 2.8 eV D) 4.8 eV E) 8.4 eV

Q22. Radionuclide Radium ^{224}Ra decays in chain till the stable isotope of lead ^{208}Pb, emitting α and β^- particles. How many α particles are emitted?

A) 24α B) 16α C) 8α D) 4α E) 3α

Q23. Phosphorus ^{32}P has a physical half-life 14.3 days and an effective half life of 13.5 days. Calculate its biological half life?

A) 4.14×10^{-3} d B) 0.8 d C) 6.94 d D) 204.4 d E) 241.3 d

Q24. Which of the following decay sequences would result in the daughter nucleus having the same proton number as the parent nucleus?

A) Alpha followed by gamma B) Alpha followed by beta (β–) followed by beta (β–)
C) Beta (β–) followed by gamma D) Beta (β–) followed by gamma followed by gamma

Q25. The radioactive isotope of Gallium ^{67}Ga, used for tumor imaging, has a half-life of 78 h. Estimate the time needed for a sample to decrease its activity from 10^5 disintegration/s to only 10 Bq?

A) 4.7 min B) 43.2 days C) 9.2 h D) 29.9 days E) 12.2 h

Q26. Alpha, Beta, Gamma, X-ray of same energy is passed through air. Which particle has least penetration?

A) Alpha B) Beta C) Gamma D) X-ray E) Beta and Gamma

Q27. Compare the range of energy loss of particles having mass m_1 and m_2 with the ratio of 1:3 and charge q_1 and q_2 of ratio 1:6.

A) 1:3 B) 1:6 C) 1:8 D) 1:18 E) 1:108

King Saud University
College of Science
Department of Physics and Astronomy

First Term (1433-34)	Second Midterm Exam	Phys. 145
Tuesday 13 Muharram 1434	27 November 2012	12:00 - 13:30

الحلول و الإجابات الصحيحة موجودة في نفس الورقة

Name:

ID number:

Classroom/Teacher:

Write your selected answers for each question here:

Q1	Q2	Q3	Q4	Q5
C	C	D	E	B
Q6	Q7	Q8	Q9	Q10
E	D	A	A	B
Q11	Q12	Q13	Q14	Q15
A	D	C	B	B

1) Please do not forget to write your name in this page
2) Separate this page for the 2 other pages
3) Give only this page at the end of the Exam

Assume $g = 9.8\ m/s^2$ in all questions.

Q1. We drop a stone from 100 m height. At what height its kinetic energy will be half the total mechanical energy?

A) 75 m B) 71 m C) 50 m D) 25 m E) 10 m

horizontal surface

Q2. Find the work developed by a 1200 kg car engine on a ~~20° incline~~ to accelerate uniformly from 30 km/h to 100 km/h.

A) 5460 kJ B) 842 kJ C) 421 kJ D) 227 kJ E) 332 kJ

Q3. A body at rest in a system is capable of doing work if:

A) the potential energy of the system is positive
B) the potential energy of the system is negative
C) it is free to move in such a way as to decrease its kinetic energy
D) it is free to move in such a way as to decrease the potential energy of the system
E) it is free to move in such a way as to increase the potential energy of the system

Q4. A 60 kg ski boy slides from rest on a frictionless incline of 30 m height. Arrived downhill, he exerts an opposing force to stop within 20 m. How much is the opposing force?

A) 144.1 N B) 588 N C) 600 N D) 760 N E) 882 N

Q5. An object thrown upwards with an initial velocity v reaches high h. If the object is now thrown with an initial velocity 2v, at what high does it raise?

A) 2 h B) 4 h C) 6 h D) 7 h E) 8 h

Q6. Three containers are filled with water to the same height and have the same surface area at the base, but the total weight of water is different for each. Which container has the greatest total force acting on its base?

(1) (2) (3)

A) container 1
B) container 2
C) container 3
D) cannot be determined from the information given
E) same force

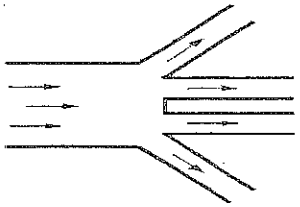
Q7. Water flows at 12 m/s in a horizontal pipe with a pressure of 3.0×10^4 N/m^2. If the pipe widens to twice its original radius, what is the pressure in the wider section? Assume the density of the water is equal to 1000 kg/m^3.

A) 3.0×10^5 N/m^2 B) 4.9×10^4 N/m^2 C) 7.4×10^4 N/m^2 D) 9.8×10^4 N/m^2 E) 2.46×10^4 N/m^2

Q8. A hole of radius 1.0 mm occurs in the bottom of a water storage tank that holds water. If the rate at which the water flows out of the hole is 5.4×10^{-5} m^3/s (At the top, the tank is open and the surface speed of water is neglected), what is the depth of the hole from the water surface?

A) 15.1 m B) 18.7 m C) 6.2 m D) 10.4 m E) 13.1 m

Q9. Water is flowing through a channel with cross-sectional area of 12 m^2 and speed of 0.75 m/s. The water then flows horizontally into four identical channels that have a cross-sectional area of 4.0 m^2. The speed of the water in one of the smaller channels is:



A) 0.56 m/s B) 0.75 m/s C) 2.3 m/s D) 3 m/s E) 0.25 m/s

Q10. A constant 0.2 A current is passed through the cell for 30 minutes. What is total amount of charge in Coulomb transported through the cell?

A) 1800 C B) 360 C C) 300 C D) 6 C E) 750 C

Q11. What would be the length of a copper wire at room temperature if it has resistance of 0.548 Ω and radius 1 mm. (resistivity of copper at room temperature is 1.72×10^{-8} Ω .m).

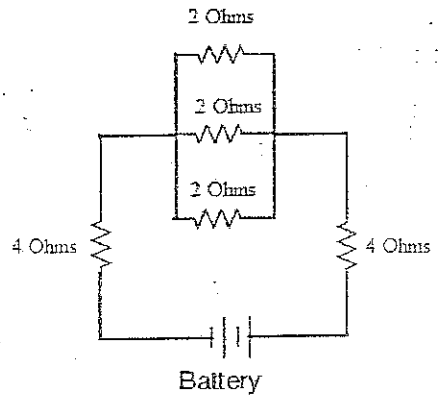
A) 100 m B) 200 m C) 1 m D) 50 m E) 70 m

Q12. A conductor of radius r, length ℓ and resistivity ρ has resistance R.

What is the new resistance if it is stretched to 4 times its original length?

A) $\frac{1}{16}R$ B) $\frac{1}{4}R$ C) R D) 4R E) 16R

Q13. The total resistance of the circuit in the following figure is:



A) 6.66 Ω B) 7.66 Ω C) 8.66 Ω D) 9.66 Ω E) 45.8 Ω

Q14. A lens has an outer radius of curvature of R_1 and an inner radius of curvature of R_2 and a refractive index n. If we use another material with refractive index greater than n, the focal distance f will be:

A) greater B) smaller C) equal D) cannot be determined from the information given

Q15. A converging lens has a refractive index of 1.5. Both sides have the same radius of curvature R. The focal length of the lens is:

A) zero B) R C) 2R D) 3R E) ∞

الحلول + الإجابات الصحيحة موجودة في نفس الورقة

King Saud University
College of Science
Department of Physics and Astronomy (Boys section)

First Term (1433-34)	First Midterm Exam	Phys. 145
Tuesday 30 Dhu Al-qa'dah 1433	16 October 2012	07:00 - 8:30 pm

Name:

ID number:

Classroom/Teacher:

Write your selected answers for each question here:

Q1	Q2	Q3	Q4	Q5
A	B	E	C	A
Q6	Q7	Q8	Q9	Q10
E	B	A	B	A
Q11	Q12	Q13	Q14	Q15
E	B	C	A	E

1) Please do not forget to write your name in this page
2) Separate this page for the 2 other pages
3) Give only this page at the end of the Exam.

Assume $g = 9.8\ m/s^2$ in all questions.

Q1. A person walks to the north on a straight road 600 m and then return back 200 m in one hour. The velocity of the person in m/s is:

a) 0.11 b) 0.22 c) 0.33 d) 6.6 e) 13.3

Q2. A person walks to the north on a straight road 600 m and then return back 200 m in one hour. The speed of the person in m/s is:

a) 0.11 b) 0.22 c) 0.33 d) 6.6 e) 13.3

Q3. The position of a particle is given by equation $x(t)=2t^2$ where t in second and x in meter. The average velocity during time interval from t=1s to t=4s is:

a) 3 m/s b) 1 m/s c) 0.1 m/s d) 9 m/s e) 10 m/s

Q4. An automobile traveling along a straight road increases its speed from 30.0 km/h to 50.0 km/h in a distance of 180 m. If the acceleration is constant, how much time elapses while the auto moves this distance?

a) 32.4 s b) 14.5 s c) 16.2 s d) 14.0 s e) 19.0 s

Q5. A car moving along a straight line changes its velocity from an initial value of 50 km/h to a final one in a distance of 300 m. The acceleration during its motion is 0.2 m/s^2. The final velocity is:

a) 64 km/h b) 17.7 km/h c) 72.1 km/h d) 66.9 km/h e) 120 km/h

Q6. A car accelerates from rest to 45 km/h in 15 s. What is the distance traveled?

a) 43 m b) 28.7 m c) 91 m d) 19 m e) 94 m

Q7. If $\mathbf{A} = -3\hat{x} + 3\hat{y}$ and $\mathbf{B} = \hat{x} - 2\hat{y}$, then the angle between the resultant $\mathbf{A} + \mathbf{B}$ and the positive direction of x-axis is:

a) 36° b) 153° c) 176° d) 117° e) 13°

Q8. If $\mathbf{A} = 2\hat{x} - 6\hat{y}$ and $\mathbf{B} = -4\hat{x} + 4\hat{y}$, what is the magnitude of the vector $\mathbf{C} = 2\mathbf{A} - \mathbf{B}$?

a) 18 b) 22 c) 64 d) 90 e) 13

Q9. The magnitude of the sum of two vectors A and B is minimum when both vectors are:

a) parallel in the same direction

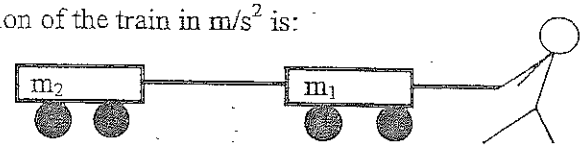
b) opposite in direction

c) perpendicular to each other

d) vector A inclined 45° with vector B

e) none of the above

Q10. A child pulls a train of two cars with $m_1 = 3$kg and $m_2 = 2$ kg by a horizontal force $F = 10$ N on frictionless surface. The acceleration of the train in m/s^2 is:

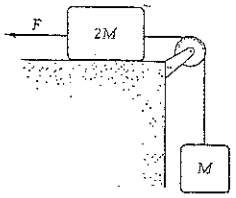


a) 2 b) 3 c) 1 d) 4 e) 5

Q11. Block A and B have equal masses and travel equal distances on straight frictionless track while a constant force F is applied on A and a constant force 2F is applied on B. The acceleration of the two blocks are related to each other by

a) $a_A = 0.25\, a_B$ b) $a_A = 2a_B$ c) $a_B = a_A$ d) $a_A = 4a_B$ e) $a_B = 2a_A$

Q12. If $F = 50$ N and $M = 2$ kg, the tension in the connecting string shown is:
(Assume that all surfaces are frictionless)



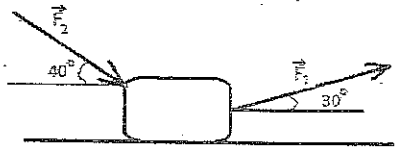
a) 20 N b) 29.7 N c) 45.7 N d) 22.6 N e) 10 N

Q13. We apply a force as great as to make an object start moving horizontally from rest. If the static and kinetic coefficients of friction are respectively 0.5 and 0.3, keeping applying the same force will make the object accelerating at:

a) 9.8 m/s^2 b) 4.9 m/s^2 c) 2.9 m/s^2 d) 2 m/s^2 e) 20 m/s^2

Q14. Find the magnitude of the acceleration on the object in the following picture.

Each force equals 15 N, and the object's mass is 2 kg.



a) 12.2 m/s^2 b) 21.7 m/s^2 c) 27.1 m/s^2 d) 19.6 m/s^2 e) 18.1 m/s^2

Q15. A 1200 kg car is traveling at 60 km/h. Due to friction on the road, it stopped in 150 m. The magnitude of the frictional force on the car is:

a) 12720 N b) 7260 N c) 5530 N d) 2222 N e) 1111 N

King Saud University
College of Science
Dept. of Physics and Astronomy

Summer Midterm Test of Phys. 145
Tuesday 20/8/1433 h
7:00 - 8:30 p.m

الحلول والإجابات الصحيحة موجودة في نفس الورقة

Student Name:

ID number:

Group:

Write the selected answers in the table below

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20

Please note that :

1. **One mark per question, total marks=20.**
2. **Do not forget to write your name on this page**
3. **Submit this page only at the end of the exam.**
4.

20

Q.1 The position of a particle is given by equation $X(t)=2t^2$ where t in second and X in metere . The average velocity during time interval from $t=1s$ to $t=5s$ is :

a) 3m/s b) 1m/s c) 0.1m/s d) 9 m/s e) 15 m/s

Q.2 A car accelerates from rest to 45 m/s in 15 s . Its average acceleration is :

a) $3m/s^2$ b) $1m/s^2$ c) $0.1m/s^2$ d) $9 m/s^2$ e) $15 m/s^2$

Q.3 A person walks on a straight road for 100 m and then return back for 20 m.

The ratio of the magnitude of the distance to the displacement of the person is :

a) Zero b) 1.5 c) 5.0 d) 1.25 e) none of the above

Q.4 Which of the following sentences is correct?

a)The average speed of an object is the elapsed time divided by the distance traveled.

b)The average velocity of an object is the ratio of the distance traveled by the elapsed time.

c)The instantaneous velocity is the limit of the average velocity, as the elapsed time tends to zero.

d)The vector position is the derivative of the instantaneous velocity.

e) All of the above are not correct.

Q.5 A car moving along a straight line changes its velocity from 40m/s to 80m/s in a distance of 200m. The acceleration during its motion is :

a) $8.0 m/s^2$ b) $9.6 m/s^2$ c) $12 m/s^2$ d) $6.9 m/s^2$ e) $0.20 m/s^2$

Q.6 If $\mathbf{A} = 2\hat{x} + 3\hat{y}$ and $\mathbf{B} = -\hat{x} + \hat{y}$, then the angle between the resultant $\mathbf{A} + \mathbf{B}$ and the positive direction of x-axis is:

a) 36° b) 42° c) 76° d) 58° e) 13°

Q.7 If $\mathbf{A} = 12\hat{x} - 16\hat{y}$ and $\mathbf{B} = -24\hat{x} + 10\hat{y}$, what is the magnitude of the vector $\mathbf{C} = 2\mathbf{A} - \mathbf{B}$?

a) 42 b) 22 c) 64 d) 90 e) 13

Q.8 A box of a mass 1500 Kg slides from rest on inclined plane, as shown in figure. Neglecting the frictional force, the magnitue of its acceleration is:

a) $8.5m/s^s$ b) $4.9 m/s^2$ c) $1.96m/s^2$ d) $5.3 m/s^2$ e) 1.33 m/s

Q.9 A car moving with a constant velocity. This means that the net force acting on it is

a) maximum b) Minimum c) Zero d) Opposite e) Forward

Q.10 A box is pulled horizontally by a 60 N force at an average velocity 1.0m/s. The power is

a) 0 W b) 3 W c) 30 W d) 50 W e) 60 W

Q.11 A woman pushes horizontally a chair with a force of 400 N. The work she does on the chair to move 2 m is:

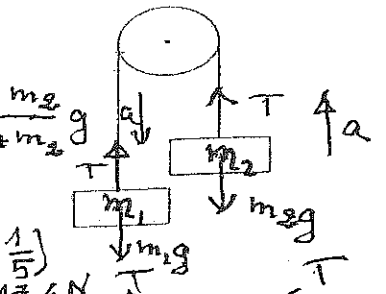
a) 400 J b) 800 J c) 200J d) 0 e) 600J

Q.12 In the figure shown, the string and pulley are massless. If m_1=15 Kg and m_2 =10 kg, the tension in the string is:

a) 117.6 N
b) 735 N
c) 980N
d) 49 N
e) Zero

$m_1 g - T = m_1 a$
$T - m_2 g = m_2 a$ $\Rightarrow a = \frac{m_1 - m_2}{m_1 + m_2} g$

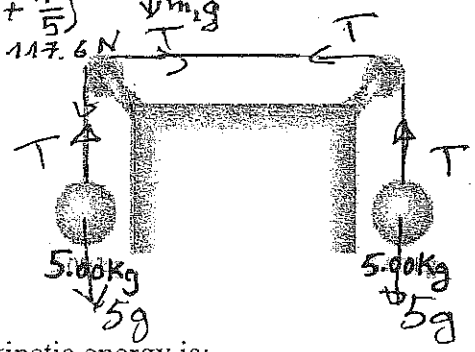
$a = \frac{g}{5} \Rightarrow T = m_2(g+a) = 10g\left(1 + \frac{1}{5}\right) = 12g = 117.6\,N$



Q.13 The tension of the string of a system as shown in the figure is

a) Zero
b) 5N
c) 49N
d) 10N
e) 98N

$T = 5g = 49\,N$



Q.14 A ball of mass 0.2 kg is thrown at 10 m/s. Its kinetic energy is:

$KE = \frac{1}{2} m v^2 = 10J$

a) 20 J (b) 10 J c) 0.2 J d) 2J (e) 10 J

Q.15 A man pushes the box of mass 5Kg in a horizontal direction by 10N force on the surface through a distance of 5m. If the coefficient of kinetic friction is 0.2 . The total work done on the box is:

$W_{net} = (F - F_f)\Delta x = (10 - 0.2 \times 5g) \times 5 = 1J$

a) Zero (b) 1.0 J c) 2.5 J d) 7.5 J e) 10.0J

Q.16 If a ball thrown straight up, how does the distance (h) it rises vary with its initial speed?

$\frac{1}{2} m v_o^2 = mgh$
$h = \frac{v_o^2}{2g}$

a) $h = v_o^2/g$ b) $h = v_o/g$ c) $h = v_o^2/g$ (d) $h = v_o^2/2g$ e) $h = 2v_o^2/g$

Q.17 The sum of two vectors A and B is maximum when both vectors are :

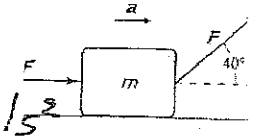
(a) parallel
b) opposite in direction
c) perpendicular to each other
d) A inclined 45° with B
e) none of the above

Q.18 A man of 60 kg standing on a floor at rest. The normal force exerted by the floor on the man is:

$N = mg$ up

(a) 588 N upward b) 120 N downward
c) 60 N downward d) 588N downward
e) 60 N upward

Q.19 In the figure shown, F=40 N and m=2.0 kg. The magnitude of acceleration of the block is:



$F + F\cos 40^\circ = ma \Rightarrow a = \frac{F}{m}(1 + \cos 40^\circ) = 35.3\,m/s^2 \simeq 35\,m/s^2$

a) 5.3 m/s^2 b) 4.4 m/s^2 (c) 35.0 m/s^2 d) 6.2 m/s^2 e) 8.4m/s^2

Q.20 How much work is done by a person lifting a 2 Kg object from a bottom of a well at constant speed of 2 m/s for 5 sec.

m v t

a) 0.22KJ (b) 0.2 KJ c) 0.24 KJ d) 0.27 KJ e) 0.51 KJ

$W = mgh = mgvt = 196J \simeq 200J = 0.2\,kJ$

King Saud University
College of Science
Dept. of Physics and Astronomy

Final Summer Exam of Phys. 145.
Tuesday 19/9/1433 H.
9:00 - 12:00 a.m

Student Name:

ID number:

Group or Teacher:

Write the selected answers in the table below

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20
Q21	Q22	Q23	Q24	Q25					

Please note that:

1. **Two marks per question, total marks = 50.**
2. **Do not forget to write your name on this page.**
3. **Submit this page only at the end of the exam.**

50

h = 6.625x10^{-34} J.s, c = 3x10^{8} m/s, g = 9.8 m/s^2, 1 atm = 1.013 10^{5} Pa, 1 eV = 1.6 10^{-19} J,
1Rontegon = 2.58x10^{-4} C/kg

Q1. Which of the following sentences is correct?
a/ Velocity and acceleration are always in the same direction.
b/ When the acceleration and the velocity are opposite, the body will accelerate.
c/ When the acceleration and the velocity are opposite, the body will decelerate.
d/ If the instantaneous velocity is zero, the instantaneous acceleration must be zero.
e/ None of these.

Q2. A driver applied brakes, so that the car comes to rest from a velocity of 20 m/s while traveling 100 m. The acceleration is:

a. $-0.5\ m.s^{-2}$ b. $-2\ m.s^{-2}$ c. $-5\ m.s^{-2}$ d. $-7\ m.s^{-2}$ e. $-20\ m.s^{-2}$

Q3. If the magnitude of a vector **A** is 49 and the angle of A with the x-axis is 35°, then the x-component will be:

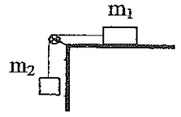
a. 40 b. 28 c. 34 d. 85 e. 60

Q4. If $\mathbf{A} = -4\hat{x} + 6\hat{y}$ and $\mathbf{B} = 2\hat{x} - 3\hat{y}$, then the angle between the resultant $\mathbf{A} + \mathbf{B}$ and the positive direction of x-axis is:

a. 78.5° b. 146.3° c. 56.3° d. 123.7° e. 33.7°

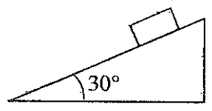
Q5. From the third Newton's law, we can conclude that:
a/ Action and reaction forces acts on the same object.
b/ Action and reaction acts on different objects.
c/ Action is always greater than reaction.
d/ Action and reaction have the same magnitude and the same direction.
e/ None of the above.

Q6. In the figure shown, the string and pulley are massless. If $m_1 = m_2 = 5$ kg and the kinetic coefficient of friction between m_1 and the horizontal surface is 0.1, then the tension in the string is:



a. 26.95 N b. 27.95 N c. 28.95 N d. 21.8 N e. 29.95 N

Q7. A box of a mass 20 kg slides from the rest on an inclined plane as shown in the Fig. What is the minimum force needed to stop it?



a. 16 N b. 28 N c. 170 N d. 196 N e. 98 N

Q8. A ball starts from rest at the top of a hill of 100 m height. If the friction is ignored, then the speed of the ball at the bottom of the hill is:

a. 44.3 m/s b. 49 m/s c. 22.35 m/s d. 12.23 m/s e. 37.05 m/s

Q9. An object is moving with speed v, if v tripled then kinetic energy will increase by:

a. 4 times b. 9 times c. 4.5 times d. 3 times e. 2 times

Q10. What is the potential energy of a 12 kg mass raised up to a height of 25 m?

a. 9000 J b. 2940 J c. 4520 J d. 7040 J e. 8030 J

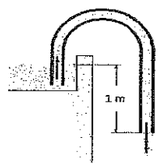
Q11. The absolute pressure at an ocean depth of 1000 m is. (Assume the density of sea water is 1024 kg/m^3)

a. $0.01\text{x}10^7$Pa b. $1.01\text{x}10^7$ Pa c. $2.01\text{x}10^7$ Pa d. $1.01\text{x}10^8$ Pa e. $3.01\text{x}10^9$ Pa

Q12. If a stream of fluid has its cross-sectional area halved in a certain region, its average velocity will be:

a. zero b. infinity c. halved d. doubled e. unchanged

Q13. The siphon shown is used to transfer liquid from a big tank. The flow velocity of the liquid at the lower level is:



a. 1.1 m/s b. 2.2 m/s c. 4.4 m/s d. 9.8 m/s e. 6.5 m/s

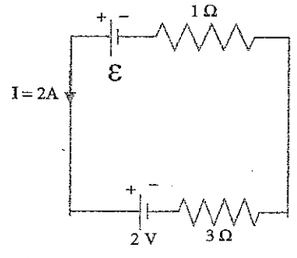
Q14. The resistivity ρ of the copper wire of length l and cross-sectional area A at room temperature is:

a/ directly proportional to length l
b/ inversely proportional to A
c/ both (a) and (b) are correct
d/ constant at room temperature
e/ none of the above

Q15. The drift velocity of an electron in a copper wire of cross-sectional area $10\text{x}10^{-6}$ m^2 is $2.0\text{x}10^{-4}$ m/s and the electron density of the copper is $5\text{x}10^{28}$ m^{-3}. The current I in the wire is

a. 16 A b. 1.6 A c. 32 A d. 160 A e. 1600 A

Q16. The value of the E.M.F $\mathcal{E}$ in the given circuit is:



a. 2 V b. 4 V c. 10 V d. 8 V e. 6 V

Q17. A lens (n=1.5) has an inner radius of curvature (concave surface) of 2.5 cm and an outer radius of curvature (convex surface) of 2 cm. The focal length of the lens is:

a. -10 cm b. 4.5 cm c. 20 cm d. 10 cm e. -17 cm

Q18. An upright (erect) image is reduced to one-fourth of the object's height when the object is placed 27 cm from the lens. The focal length of the lens is:

a. -7 cm b. - 9 cm c. 7 cm d. 9 cm e. 12 cm

Q19. An object located 36 cm in front of a lens forms an image on a screen 12 cm behind the lens. The magnification of the lens is:

a. 2 b. -1/4 c. 1/4 d. 1/3 e. -1/39

Q20. The minimum frequency of light causing emission of electrons from a metal of work function of 3 eV is:

a. 7.25×10^{14} Hz b. 7.25×10^{54} Hz c. 3×10^{33} Hz d. 5.26 kHz e. 13×10^{54} Hz

Q21. In a Compton scattering experiment, the initial and final frequencies of X-rays are 3.7×10^{20} Hz and 2.2×10^{20} Hz respectively. The energy of the recoil electrons is:

a. 15 keV b. 150 keV c. 278 keV d. 432 keV e. 621 keV

Q22. How many positive ions of charge +e can be produced in 5kg of air by 2 Rontgens? X-ray exposure?

a. 16×10^{15} b. 35.8×10^{15} c. 25.8×10^{15} d. 2.58 e. 16.125×10^{19}

Q23. In the following nuclear decay ${}^{14}_{6}C \rightarrow {}^{14}_{7}N + X$, X is:

a. α b. neutron c. β^+ d. β^- e. γ

Q24. Iodine isotope ${}^{131}\mathrm{I}$ is used in the treatment of thyroid disorders. Its half-life is 8.1 days. What fraction of iodine remains after 16.2 days?

a. 2.0 b. 0.5 c. 0.25 d. 0.125 e. 4.0

Q25. The ratio of kinetic energy loss of protons (${}^{1}_{1}H$) and deutrons (${}^{2}_{1}H$) having the same kinetic energy is:

a. 1:3 b. 1:2 c. 1:4 d. 1:8 e. 1:16